Agriculture in Interior Borneo

Shifting Cultivation and Alternatives

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Flying over the island of Borneo (or Kalimantan as it is known to Indonesians), one feature of the landscape immediately catches the eye. The hills are a checkerboard of tall and short vegetation, of clumps of old forest on ridgetops and tangles of newer growth in long valleys, of brilliant green plots of hill rice interspersed with former fields where forest species are just getting a foothold. Arriving in early September just before the rains of the northeast monsoon, the visitor is treated to an even more striking sight—columns of smoke rising from thousands of fields burning throughout the island. The patchy vegetation, the smoke, the newly charred fields are markers of a pattern of land use that is very prevalent on the forested island. Known as shifting cultivation, swiddening, slash-and-burn, and to many Bornean natives as ladang farming, this type of agriculture is a cyclical one used for centuries not only in Bornean forests but throughout the humid tropics of the world. It is, however, a type of agriculture that may, and indeed does, appear strange or “primitive” to some people who are more familiar with the neat grainfields of the temperate zone.

Shifting cultivation was quite roundly condemned by European and North American-trained agronomists and foresters for many years. In recent decades, however, the views of many experts have changed dramatically. Rather than being criticized as a wasteful, primitive, and unproductive system, shifting cultivation is now hailed by many as a good way of making a living under the conditions that many tropical areas offer (Fig. 1). Although some foresters continue to decry the loss of commercial-grade timber to the practice, most experts agree that in its traditional form, practiced where people are few and lands are forested, shifting cultivation can be an efficient and conserving use of resources. This shift in opinion is largely a result of careful investigations conducted in Borneo and elsewhere by anthropologists, geographers, and others. Their studies show that widespread and long-term environmental deterioration need not be a result of shifting cultivation, that most swiddeners do not work very long hours and yet harvest quite a reasonable yield, and above all, that other agricultural systems that have been suggested or put into operation in the humid tropics have fared far worse.

Although traditional upland shifting cultivation may be an appropriate way of farming in those areas of Borneo where human densities are still very low, populations in many parts of the island are rising and use of forests is intensifying. In some areas, the relatively large acreages needed to sustain the system are no longer available, and the need to preserve dwindling reserves of rain forests is increasingly pressing. More land-intensive agricultural practices will have to replace shifting cultivation if forests are to be preserved and people are to make an adequate living. Unfortunately, the search for productive, sustainable agriculture is not an easy one; systems that are highly successful in the temperate zones have been notorious failures in the hot, wet conditions of the tropics. Systems that have proved excellent in one cultural setting often are rejected in another. And many new technologies that have been proposed demand the importation of expensive and scarce chemicals, seeds, and tools that few swiddeners can afford. From where will successful models of intensive farming for Borneo come?

The search need not lead far from Borneo itself. The commonly described pattern of shifting cultivation, a system of short-term cropping and long-term following of land, is often erroneously assumed to be the only type of agriculture known to native groups of the island. In reality there are many other forms of cultivation—shifting and permanent-field—practiced in Borneo. Some of these may indeed offer well-adapted models of resource use for many parts of the island where populations are growing more dense and
Neither the crops planted nor the tools used, neither the cycles followed nor the yields realized remain constant from region to region. In Borneo alone many differing and changing forms are practiced.

The Iban are one group of shifting cultivators whose agriculture has been described by several researchers, including the anthropologists Freeman (1955, 1957), Sudive (1967), and myself (1980). Each one of these investigators described farming patterns that differ somewhat from those found by the others, largely because each studied different Iban communities. However, the practices of the Iban who farm the steep hills of the Batang Lupar drainage (Fig. 7) in Sarawak’s Second Division are, in broad outline, representative of much of the shifting cultivation that is carried out in Borneo (Padoch 1983). That ancient homeland of the Iban, farmed for centuries, is also a region where poor yields and pockets of environmental deterioration are signaling a need to study and pursue alternatives.

Along the highland rivers and streams of the Second Division there has long been a dearth of old forest to cut. Therefore the Iban who farmed those slopes in the mid-1960s commonly mowed or fields in areas of younger, secondary forest. Use of secondary growth is not undesirable. Even when older growth is available, most Iban swiddeners prefer to make their new farms on land that has previously been cleared but that now bears trees of considerable size. In a few areas primary forest is still left for raising and, but such pioneering practices are becoming very rare.

Cutting even secondary forests is a tricky task. First undergrowth and smaller trees are shot with blowpipes or other weapons, then larger trees are cut (Fig. 2). Particularly if old forest is being felled, this is a job that requires great strength, skill, and courage. Men cut the forest giants, although some Iban women can also wield a heavy axe and bring down smaller trees.

Clearing a plot is followed by a period of waiting for the slash to dry. The rainy climate of Borneo makes this a time of anxiety for shifting cultivators. Each day the cut vegetation lies under the equatorial sun it becomes drier and quicker to burn. But each day as the monsoon season approaches, there is also a risk of a soaking rain. A good, even, complete burn is important for the success of the swidden. Burning clears the land, deposits a nutrient-rich layer of ash over the soil, and destroys any weeds and pests that may have invaded the area (Fig. 3).

A poor burn augers badly for the whole season’s farming effort. Once the fields have been fired as completely as possible—sometimes some secondary burning is necessary—planting begins (Fig. 5). No land preparation disturbs the surface of the soil. Only small holes are punched with a dibble stick and seeds are dropped in. In every new Iban swidden the most important crop is rice, often six or more varieties; however, typically, a broad assemblage of minor crops is planted as well. Some are mixed in randomly, others may be clustered in particularly favorable or convenient areas of the farm.

One weeding is usually all it takes to protect the planted crops from invading vegetation, but constant vigilance, day and night, is frequently required to save them from marauding animals. Thus, particularly in areas where extensive forests border rice fields, Iban swiddeners spend many weeks living in temporary houses in the midst of their fields (Fig. 6).

The traditional rice varieties favored by most inland Iban farmers tend to ripen slowly, only after six or seven months are they ready to be reaped. When the fields are finally harvested on the upper Batang Lupar, yields of about 800 to 900 pounds of rice per acre are considered good. This may not appear high, but neither is the labor input of about 80 days per acre. It is required to produce that rice. Swiddeners in the region strive to satisfy the needs of their own households for rice, but quite frequently that goal is not achieved and wage work must be found to make up the year's needs. Market production of rice is virtually unknown. Other areas of Sarawak, more recently settled and supporting fewer people and more forests, tend to be more productive.

**Swiddening in the Hills of Sarawak**

Shifting cultivation has innumerable variants, as one might expect of such a widespread way of using forest and soil resources.
Borneo

Using “Abandoned” Swidden-Fallow

The search for more intensive forms of land use to replace shifting cultivation should start with a reexamination of swidden farming as it now exists in Borneo, with a particularly hard look given to the fallow stage. We have long assumed that after cropping a field for a year or two, shifting cultivators abandon their fields to the spontaneous invasion of forest species. Indeed, that’s how we defined swiddening.

“Natural” fallow, we know, has important ecological functions, some of which were mentioned above; however, it has long been assumed that these benefits were bought at the sacrifice of the economic use of the old swidden fields. But recent research is proving some of those assumptions wrong. New questions: Are all swidden fields really abandoned and economically unproductive? Can they be made more productive? Evidence gathered in many tropical regions, including Borneo, suggests that some of those fields that we have called “abandoned” may not be abandoned at all and that intensifying the use of swidden fallows may be a promising direction for shifting cultivators.

Sarawak’s Iban, like other Bornean shifting cultivators throughout the tropics, regularly go to their old swiddens to find greens for their soup pots, fruit for a snack, wood for their cookstoves, and materials for constructing their houses. Some of these economically important products are remnants of the crops that were planted, some are spontaneous invaders that came in after the crops were cleared and that escaped the burn. Many of those not deliberately planted have probably been helped along by some occasional management: a little weeding is often done around a medicinal plant, or a potentially valuable liana may be cleared from a useful timber tree.

Many economic uses of swidden fallows and such “minimal” management techniques are very difficult to detect, describe, and measure and have largely been ignored by scientists. But while some swidden fallows are very casually managed and may yield products that contribute only slightly to a household’s subsistence, the fallows of other swiddeners are transformed into orchards of high commercial value.

Sarawak’s Iban have planted significant quantities of citrus and other marketable fruits in old fields. Similar practices are found in other parts of Borneo, with some indigenous groups throughout the tropics. For example, the Kayan of the far interior Apo Kayan maintain very diverse orchards in limited areas of swidden fallows (Pers. com. 1987). Still other swiddeners transform their fallows into pepper plantations (Fig. 9). In further commercial use of swidden fallows possible or desirable? The answer undoubtedly lies in the specifics of each situation. In all cases the intensification of the swidden system in the Amazon Basin have been hailed as examples of how traditional “agroforestry” displays great environmental wisdom and considerable commercial potential (Denevan and Padoch 1988, Padoch et al.)

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Commercial concerns, however, have also been raised. The “weed” trees, shrubs, and herbs growing in these gardens are often useful plants. Moreover, tolerance of weeds and other vegetation by the shifting cultivator may, in fact, be an ecologically far wiser strategy than the sophisticated planters’ clean weeding (Poloher 1976:290).

The cultivation of tree crops other than rubber may also allow a fallow to continue to yield an economic return while still performing the fertility-enhancing functions of a “natural” fallow. Some Iban farmers have planted significant quantities of citrus and other marketable fruits in old fields. Researcher Tim Jessup reports that the Kenyah of the far interior Apo Kayan maintain very diverse orchards in limited areas of swidden fallows (pers. com. 1987). Still other swiddeners transform their fallows into pepper plantations (Fig. 9). In further commercial use of swidden fallows possible or desirable? The answer undoubtedly lies in the specifics of each situation. In all cases the intensification of the swidden system in the Amazon Basin have been hailed as examples of how traditional “agroforestry” displays great environmental wisdom and considerable commercial potential (Denevan and Padoch 1988, Padoch et al.)
rule in much of interior Borneo, the Kerayan is unusual in that it is totally inaccessible by river, the usual form of transport on the island. Because the area's remoteness virtually eliminates the possibility of marketing agricultural products, farming in the Kerayan is limited almost exclusively to subsistence production. Rice is by far the most important crop, and shifting cultivation is known and practiced. But it is a form of irrigated rice production (left box in Lun Dayeh) that distinguishes this group from most of Borneo's interior farmers. The Lun Dayeh carry on a system of farming permanent levied and dyked pond-fields (Fig. 11) that regularly produces great surpluses of rice.

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judging the quality of the soils and waters and the suitability of landforms in their area, as well as their proven system of rice production, that their lands produce great harvests (Padloch 1989). While nature has not blessed the Kerayan with exceptionally good soils, the region has an advantage over most of interior Borneo. Although it is a hilly, almost mountainous region, valleys between hills tend to be flat-bottomed, broad, and well-watered. Rather than use these valleys and waters as Bihan paya swiddens do, the Lun Dayeh have improved on nature by controlling water levels and canals, dykes, and watergates (Fig. 12). These irrigation works do not rival the wonders of Java, Bali, and northern Luzon, but they do allow farmers to make sure their rice crops get the proper amount of water at the proper time.

Pond-field farming takes swamp rice cultivation several steps further, although the Lun Dayeh, like paya farmers, spend little time preparing the land. The vegetation that needs to be slashed is mostly just the previous year's rice straw mixed with a few herbaceous weeds (Fig. 13). These are cut and trampled into the soil or pulled out and piled on dykes. Much of the clearing is not done by the Lun Dayeh at all but rather by their water buffalo which are allowed to roam through the fields before planting time (Fig. 14). These beasts will eat some rice straw, trample some into the soil, break up any hard clods, and fertilize the fields by defecating into them. Occasionally, water buffalo will make the farming pay dearly for their services. They can totally destroy dykes and waterworks, making extensive repairs necessary. While repairs of earthworks are underway, seed
In the area of Keraian, there is a need for additional water which the Lam Dayeh know how to control. By keeping the water levels in their rice fields high throughout the growing season, Lam Dayeh virtually eliminate weeding. Good water control also means that harvests rarely fail, and the Lam Dayeh rarely reap less than a ton of rice per acre (Fig. 15). These yields are more than enough to meet their household needs.

The Lam Dayeh system certainly functions well in the remote valleys of the Keraian region. How easily this system might be transferred to other parts of the island needs to be investigated. Some of that testing is already being done on a small scale. Lam Dayeh schoolteachers, transferred by the government outside their homeland, have brought their traditional methods to the steeper terrain of areas like the Ako Kayan highlands (T. Jessup, pers. com. 1987). Preliminary reports indicate that the Kms Mahar of that area have had good, if yet limited, results.

**Sago Orchards of the Melanau**

All the resources used in methods we have looked into up to now have been involved in producing rice, a staple throughout the island. There are, however, still other production methods that do not include rice at all. The Melanau people of the Oya, Minah, and other rivers along the coast of Sarawak have traditionally cultivated the sago palm for subsistence and commerce (Morris 1952). They not only produce substantial quantities of the palm starch, but have done this on acidic peat swamp soils believed by many to be completely unsuitable for agriculture.

Melanau sago orchards are established much like other agricultural enterprises in Borneo: trees are felled and burned to clear the fields. But rather than digging in rice, the Melanau plant suckers of the sago palm (Metroxylon sagu) into the swampy fields. If the young suckers survive the attacks of monkeys, pigs, ants, and honey-bees, the bamboo canes will grow and produce the starch for sago. The Melanau produce a fast-growing crop in the trees' partial shade. The soil is protected from the tropical sun and rain as the palms grow, and local farmers even suggest that the extra vegetation may shield young suckers from attacks by pests. The Melanau have reported a loss of sago starch for centuries from the same lands, with no evidence of environmental deterioration. Using traditional Melanau methods as a model, possibly substituting other crops for sago, may offer another promising alternative for shifting cultivators running out of arable land.

**Duck Egg Production in South Kalimantan**

The final and certainly the most unusual production system that we will review is found in swamps at the other end of Borneo. The Ayalu district is located near the city of Banjarmasin in South Kalimantan, in an area of relatively high population density. Since the area has long had little free land for rice cultivation, the commercial production of duck eggs has supplemented rural incomes since at least the beginning of this century (Vondal 1987). Patricia Vondal has studied the Banjarese farmers who produce eggs of a local breed of duck (Anas platyrhynchos borneo) for export to urban markets, and reports that producers can earn as much as 20 times the $20 per capita annual income of farmers with similar amounts of land in Java or Bali (1987:28). The swampy area where this highly successful production takes place would be considered certainly inhospitable if not uninhabitable by many.

Historically, Banjarese duck egg producers allowed their flocks of ducks out during the day to scavenge for food in the swamps and rivers surrounding the village, but caged them at night to keep them. In the dry season the ducks would remain caged to prevent them from damaging local rice fields. However, when human population densities increased and rice cultivation expanded, the traditional herding system led to considerable conflict. The herders responded with ingenious and innovative problems of resource scarcity and change. When free-ranging ducks became pests, the herders learned to produce eggs by caging their ducks throughout the year and providing them with regular feed. When the traditional duck feeds, sago and fresh fish, became scarce,
villagers substituted widely available dried fish, snails, rice bran, and various types of swamp vegetation. It is interesting to note that successful intensification of duck production in the Alabio swamps did not occur in the manner recommended by government experts, i.e., substituting a commercially prepared duck feed imported from East Java. Instead, producers used a range of locally available products to increase their flocks, increase duck egg production, and maintain that production through all seasons. The particular innovations introduced by Alabio duck producers are peculiar to that system; however, the readiness to change and the experimentation with local products that Vondal documents are qualities that are found throughout Borneo’s rural populations.

Conclusions

The systems briefly outlined here hardly even skim the surface of the resource use methods found in Borneo. Variation and adaptation to local circumstances are the rule throughout the island. I have presented only a few of the production types used by groups indigenous to Borneo; there are other systems that are successfully employed by immigrant groups, such as the Chinese, Buginese, and Javanese, who have resided for a long time on the island.

These few examples show that the long-standing equation of Borneo agriculture with shifting cultivation is not an accurate one. Although the marks of shifting cultivation can still be found throughout the island, other agricultural types have been successfully used for a long time. Shifting cultivation will continue to be practiced in Borneo’s interior areas for many years to come; however, as fallow times shrink and yields diminish in many regions, other agricultural systems will need to be adopted. Some of the examples presented above may show the direction for the future development of agriculture in the forests of Borneo.

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